# Appendix 3

Air Ventilation Appraisal

Prepared by Ramboll Hong Kong Limited

SECTION 16 PLANNING APPLICATION FOR PROPOSED MINOR RELAXATION OF PLOT RATIO RESTRICTION (20% OF NON-DOMESTIC PLOT RATIO CONVERSION TO DOMESTIC PLOT RATIO. TOTAL PLOT RATIO REMAINS UNCHANGED) FOR MIXED USE DEVELOPMENT AT PLANNING AREA 28A AND AREA 28B, HUNG SHUI KIU

**AIR VENTILATION APPRAISAL** 



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Document No.	R9663_V1.4.docx

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## **1. INTRODUCTION**

#### 1.1 Project Background

1.1.1 Ramboll Hong Kong Limited (the Consultant) has been commissioned by the MTR Corporation Limited (hereafter refer to as the "MTRC") to conduct this Air Ventilation Appraisal in support of the Section 16 planning application for the Proposed Minor Relaxation of Plot Ratio Restriction (20% of non-domestic plot ratio conversion to domestic plot ratio. Total plot ratio remains unchanged.) for Mixed Use Development (hereafter refer to as the "Proposed Development") at Hung Shui Kiu at Planning Areas 28A and 28B (hereafter refer to as the "Subject Sites")." The proposed development is located at Planning Areas 28A and 28B. The Subject Sites are zoned as "Other Specified Uses" annotated "Mixed Use" "OU(MU)".

#### 1.2 Purpose

- 1.2.1 The purpose of this Air Ventilation Appraisal is to assess the air ventilation impact of the Proposed Development on the surrounding area by comparing the Proposed Scheme to the Baseline Scheme.
- 1.2.2 The current application involves only a 20% non-domestic plot ratio conversion to domestic plot ratio, while the total plot ratio remains unchanged. The maximum building height and total plot ratio of the Proposed Development conform to the approved HSK/HT OZP No. S/HSK/2. Additionally, the planning and urban design elements including terrace frontage, shopping street and pedestrian street in Planning Areas 28A and 28B, as stipulated in the approved HSK/HT OZP, will be maintained.

#### **1.3 Baseline Scheme and Proposed Scheme**

#### **Baseline Scheme**

- 1.3.1 The Subject Sites are planned for high-density residential development and commercial development in close proximity to the railway stations. The Baseline Scheme refers to the building height concept and planning and design concept under the approved Hung Shui Kiu and Ha Tsuen Outline Zoning Plan (HSK/HT OZP) No. S/HSK/2 (see Appendix 1) and the potential air path under the Hung Shui Kiu New Development Area Planning and Engineering Study - Investigation - Stage 3 Air Ventilation Assessment (Final) (Agreement No. CE 2/2011(CE)) (see Appendix 2). According to the approved HSK/HT OZP No. S/HSK/2, Planning Areas 28A and 28B are subject to a maximum PR of 7 (of which the domestic PR should not exceed 4.5). For Planning Area 28A, a stepped building height profile descending from the east to west is introduced. The eastern portion of Planning Area 28A is subject to a maximum building height of 180mPD. The western portion of Planning Area 28A for non-domestic development is subject to a maximum building height of 60mPD. Planning Area 28B is subject to a maximum BH of 180mPD. The Baseline Scheme is a hypothetical scheme developed based on the OZP stipulations mentioned above. In the Baseline Scheme, Planning Areas 28A and 28B each consist of eight towers with podium.
- 1.3.2 Terrace frontage has been incorporated along the shopping streets near the proposed HSK Station to enhance wind penetration at the pedestrian level. In the Baseline Scheme, to mitigate potential noise from the elevated Tuen Ma Line, domestic developments in Planning Area 28A are set back 60 m from the western boundary of the site, placing them over 90 m away from the railway tracks.
- 1.3.3 **Figure 1** shows the indicative layout of the Baseline Scheme with good design features.



#### Proposed Scheme

- 1.3.4 The Proposed Scheme will include the same elements as the Baseline Scheme, with a 20% conversion of PR/GFA between non-domestic and domestic uses. It is assumed that the Proposed Scheme will feature eight towers in Planning Areas 28A and 28B, respectively. All towers have a maximum building height of 180mPD.
- 1.3.5 **Figure 2** shows the indicative layout of the Proposed Scheme with good design features. The plan is indicative and non-binding. All levels, blocking and building structures are subject to detailed design. Layout for the future development in Planning Areas 28A and 28B will be governed by Master Layout Plan submission under the lease.
- 1.3.6 Same as the Baseline Scheme, a stepped building height (BH) profile is proposed for Planning Area 28A, near the planned HSK Station, descending from east to west. The eastern portion of the site is designated with a maximum height of 180 mPD, while the western portion for non-domestic development has a maximum height of 60 mPD. The maximum BH and total plot ratio (PR) in the Proposed Scheme comply with the OZP restrictions. Terrace frontage (i.e. permeable terraces and setting back of first floor of podium that a maximum BH of 5m and 10m in width) is adopted along the shopping streets near the proposed HSK Station to improve wind penetration at pedestrian street level.
- 1.3.7 Under the Proposed Scheme, due to potential noise impact from the elevated Tuen Ma Line, domestic development in Planning Area 28A have 60m setback from the western boundary of the site, which is more than 90m away from the railway tracks. For the Planning Area 28B, no setback is recommended as there is no railway noise impact upon it in view of the site is immediate next to the railway station which can provide sufficient protection.

#### Comparison between the Baseline Scheme and Proposed Scheme

- 1.3.8 The maximum domestic plot ratio for the Baseline Scheme is 4.5, and the maximum non-domestic plot ratio is 2.5. In contrast, for the Proposed Scheme, the maximum domestic plot ratio is 5, while the maximum non-domestic ratio is 2. The Baseline Scheme and the Proposed Scheme have the same maximum building height.
- 1.3.9 The layouts of the two schemes are quite similar, including the massing of both the podium and residential towers. Compared to the Baseline Scheme, building footprint of some towers of the Proposed Scheme will be slightly enlarged to accommodate the additional domestic floor area converted from non-domestic floor area.
- 1.3.10 However, the layout under the Proposed Scheme is only indicative, and future developments in Planning Areas 28A and 28B will be guided by the Master Layout Plan submission according to the lease.
- 1.3.11 It is important to note that same as the Baseline Scheme, the Proposed Scheme maintains the identified air paths and breezeways as well as good design features, such as stepped building heights (BH), setback from the western boundary in Planning Area 28A, and terrace frontage along the shopping streets near the HSK Station.



## 2. SITE WIND AVAILABILITY

#### 2.1 Experimental Wind Data

- 2.1.1 The wind data sets from the recent detailed study on the AVA as summarized in the "Hung Shui Kiu New Development Area Planning and Engineering Study Investigation Stage 3 Air Ventilation Assessment (Final) (Agreement No. CE 2/2011(CE))" (by CEDD, AECOM Asia Company Ltd, April 2017) is referred.
- 2.1.2 **Figure 3** shows the relevant wind rose diagram representing the frequency and wind speed distribution of the district concerned for both annual and summer conditions.
- 2.1.3 According to the experimental wind data, the annual prevailing winds come from E, ENE and N directions whereas the summer prevailing winds come from SW, E and S.

#### 2.2 Regional Atmospheric Modelling System (RAMS)

- 2.2.1 The relevant wind data (RAMS) for the district (grid: X:042, Y:067) under concern has been extracted from the Planning Department's website for Subject Site wind availability data (at 200m). The annual prevailing winds come from NNE, E and NE directions whereas the summer prevailing winds come from S, SSW and SSE. Below are the Wind rose extracted from the Planning Department's website.
- 2.2.2 **Figure 4** shows the relevant wind rose diagram representing the frequency and wind speed distribution of the district concerned for both annual and summer conditions.

#### 2.3 Summary of Existing Site Wind Availability

2.3.1 Based on the wind data obtained from both the experiment and RAMS, the annual prevailing wind directions are N, NNE, NE, ENE, and E. In contrast, the prevailing winds during summer are E, SSE, S, SSW, and SW.

#### 2.4 Potential Air Path/ Breezeways

- 2.4.1 It is confirmed that all the major noise barriers, elevated structures, existing, planned and committed developments (including their heights) within the surrounding area have been taken into account in this study.
- 2.4.2 The appraisal is based on the proposed surrounding environment upon completion of the Hung Shui Kiu/Ha Tsuen New Development Area rather than the existing conditions.
- 2.4.3 According to the approved HSK/HT OZP No. S/HSK/2, the major air paths include the north-south running Regional Plaza and the adjoining open space spines diverting wind to penetrate through the town centre to Tin Sam Tsuen, San Lee Uk Tsuen and various villages in Ha Tsuen. In addition, northeast-southwest running Castle Peak Road could divert wind to development along the road. Finally, the shopping street and pedestrian street between Planning Areas 28A and 28B enhances east-west wind penetration. Planning and Urban Design Concept of the approved HSK/HT OZP No. S/HSK/2 is illustrated in the **Appendix 1** of this report for easy reference.
- 2.4.4 Referencing "Hung Shui Kiu New Development Area Planning and Engineering Study Investigation – Stage 3 Air Ventilation Assessment (Final)", in addition to the potential air paths and breezeways identified in the OZP, the proposed road to the east, north and south of Planning Areas 28A and 28B could further enhance wind penetration nearby, along the road connection. Figure 1E-Potential Air Path in RODP of May 2016 of the Stage 3 Air Ventilation Assessment is illustrated in the **Appendix 2** of this report for easy reference.



### 3. EVALUATION OF AIR VENTILATION PERFORMANCE

#### 3.1 Wind Flow under Annual Condition and Summer Condition

- 3.1.1 Since the current application involves only a 20% conversion of the non-domestic plot ratio to domestic plot ratio, with the total plot ratio remains unchanged, the maximum building height and total plot ratio of the Proposed Development conform to the approved HSK/HT OZP No. S/HSK/2. Additionally, the planning and urban design elements for Planning Areas 28A and 28B, as stipulated in the approved HSK/HT OZP No. S/HSK/2, will be maintained. Therefore, the air ventilation performance of the Proposed Scheme and the Baseline Scheme, with respect to the same wind directions under both annual and summer wind conditions, is discussed below.
- 3.1.2 **Figure 5** shows the annual and summer prevailing wind direction for both the Baseline Scheme and the Proposed Scheme. **Figure 6a** illustrates the expected wind flow direction under the Baseline Scheme, while **Figure 6b** illustrates the wind flow direction under the Proposed Scheme.

#### 3.2 Annual Condition – N, NNE and NE Winds

- 3.2.1 Under N, NNE and NE wind directions, since Planning Areas 5 and 29 are zoned "Village Type Development" which are the existing San Lee Uk Tsuen and Tin Sam Tsuen, it is expected that the incoming winds will not be significantly obstructed.
- 3.2.2 The prevailing winds will primarily flow along the Regional Plaza and the adjacent open space spines. The stepped building height profile, ranging from 60 mPD to 180 mPD, along with the terrace frontage of Planning Area 28A, is expected to further enhance wind flow in this area.
- 3.2.3 The downwind areas affected by N, NNE, and NE winds include Planning Areas 26A and 26B, which are zoned as "Government, Institution or Community" ("G/IC") and "G/IC (1)" respectively, with a maximum building height of 130 mPD. Additionally, Regional Plaza, Pedestrian Street and Road L15 are also located in the downwind area. It is expected that the proposed development, a building height of 180 mPD, will cause some blockage effects in these areas, as it exceeds the 130 mPD. However, since the maximum building height remains consistent with the stipulations in the OZP, the blockage effects or wake zones created by the Proposed Scheme are anticipated to be comparable to those of the Baseline Scheme.
- 3.2.4 Additionally, the proposed road L12 to the east of Planning Areas 28A and 28B, which aligns in NE-SW direction, could also facilitate portion of the incoming winds.
- 3.2.5 As compared to the Baseline Scheme, the maximum building height, total plot ratio and the disposition of the residential towers remain unchanged under the Proposed Scheme, with only a slightly increase in the tower footprint. Additionally, the Subject Sites are not located within any identified air path or breezeway, both of which are maintained. Therefore, it is anticipated that the Proposed Scheme will not result in any significant adverse impacts when compared to the Baseline Scheme.

#### 3.3 Annual Condition – ENE and E Winds

3.3.1 Planning Areas 27A and 27B zoned "Residential (Group A)2"and Planning Area 27C zoned "Residential (Group A)3", with a maximum building height of 160mPD, are at upwind area of annual prevailing ENE and E winds. The maximum BH of the approved development in Planning Areas 27A and 27B is 175mPD and 165mPD respectively, referred to the approved planning application No. A/HSK/452. Consequently, it is expected that the ENE and E winds will primarily flow along the Pedestrian Street, with a smaller portion of the wind likely moving along the two proposed roads L15 and L16



to the south and north of Planning Areas 28A and 28B, with reference to the air path in Stage 3 Air Ventilation Assessment. The terrace frontage facing the Pedestrian Street would further improve wind penetration. These proposed roads will allow the ENE and E winds to flow through to the Regional Plaza and Riverside Promenade, which are located in the downwind area of the Subject Sites. On the other hand, the Pedestrian Street and Road L15, also situated in the downwind area, will remain unaffected since the ENE and E winds primarily flow along these roads. The downwind area also includes Planning Area 26A, which abuts the proposed development, has a maximum building height of 130 mPD, lower than that of the Proposed Scheme. However, the maximum building height of the Proposed Scheme remains unchanged from the Baseline Scheme. Thus, the impact on Planning Area 26A is expected to be similar under both schemes. It is anticipated that the proposed development will not have any significant impact on Planning Area 26. The further downwind areas include Planning Areas 32A, 32B, and 32D, all of which have a maximum building height of 200 mPD. Since this height is greater than that of the proposed development and the distance from the subject sites is approximately over 160m, it is anticipated that the proposed development will not have any significant impact on air ventilation in these areas.

3.3.2 As compared to the Baseline Scheme, the maximum building height, total plot ratio and the disposition of the residential towers remain unchanged under the Proposed Scheme, with only a slightly increase in the tower footprint. Additionally, the Subject Sites are not located within any identified air path or breezeway, both of which are maintained. Therefore, it is anticipated that the Proposed Scheme will not result in any significant adverse impacts when compared to the Baseline Scheme.

#### 3.4 Summer Condition – SSE and S Winds

- 3.4.1 Under SSE prevailing wind, the Planning Area 27A is zoned as "Residential (Group A)2" with a maximum building height of 175mPD. It is located to the east of the Subject Sites, and at the upwind area of SSE prevailing wind. On the other hand, under the S wind, the "G/IC" and "G/IC(1)" zones in Planning Areas 26A and 26B, with a maximum building height of 130mPD, are situated to the south of the Subject Site. As a result, it is anticipated that the wind availability to the Subject Sites would be reduced. Most of the upcoming SSE and S winds are expected to flow along the proposed road connection, particularly the road L15 to the south and L12 to the east of Planning Area 28A.
- 3.4.2 The downwind areas under SSE and S winds are Tin Sam Village in Planning Area 29 and the planned open space in Planning Area 33 to the north of the Regional Plaza, as well as Pedestrian Street, Regional Plaza and Road L16. Given the already reduced wind availability to the Subject Sites due to the high-rise buildings at the upwind area, it is anticipated that the Proposed Scheme will not cause any significant adverse impacts compared to the Baseline Scheme

#### 3.5 Summer Condition - SSW and SW Direction

3.5.1 Under SSW and SW prevailing wind, the "G/IC" zones in Planning Areas 26A and 31A, which have a maximum building height of 130mPD and 80mPD respectively, are situated in the upwind area of the Subject Sites. As a result, it is anticipated the wind availability would be reduced. Most of the wind is expected to flow along the Regional Plaza and the adjoining open space spines, as well as the proposed road to the east of the Subject Site, moving northward. Additionally, the terrace frontage facing HSK station would further enhance wind penetration along the Regional Plaza.



3.5.2 The downwind areas under SSW and SW winds are Tin Sam Village in Planning Area 29 and residential developments in Planning Areas 27B and 27C, as well as Pedestrian Steet and Road L16. As compared to the Baseline Scheme, the maximum building height and total plot ratio remain unchanged under the Proposed Scheme. Additionally, the Subject Sites are not located within any identified air path or breezeway, both of which are maintained. Therefore, it is anticipated that the Proposed Scheme will not result in any significant adverse impacts when compared to the Baseline Scheme.



## 4. CONCLUSION

- 4.1.1 After considering the potential air ventilation impacts of the Proposed Scheme, the proposed development has conformed to the approved HSK/HT OZP restrictions with respect to its stipulated urban design features, including the shopping street, pedestrian street, setback and terrace frontage. Taking into consideration of the existing topography and the surrounding environment upon completion of the HSK/HT New Development Area, it is considered that the Proposed Development should not have a significant adverse impact on the surrounding environment.
- 4.1.2 As compared to the Baseline Scheme, the maximum building height and total plot ratio remain unchanged under the Proposed Scheme. The stepped building height profile from 180mPD to 60mPD in Planning Area 28A, the 60m setback from the western boundary of domestic tower in Planning Area 28A and the terrace frontage along the Pedestrian Street, as outlined in the approved OZP, are all complied with.
- 4.1.3 According to the Hung Shui Kiu New Development Area Planning and Engineering Study – Investigation – Stage 3 Air Ventilation Assessment (Final), the air path and breezeway of the future NDA are the Regional Plaza and the adjacent open space spines, as well as the future road networks under both Annual (N, NNE, NE, ENE and E winds) and summer wind (E, SSE, S, SSW and SW) conditions. The Subject Sites are not located within any air path or breezeway. In addition, the pedestrian walkway between Planning Areas 28A and 28B is kept in the Proposed Scheme which would facilitate the wind passing through the site from southeast to northwest. Therefore, the Proposed Scheme would unlikely impose a significant impact on the surrounding sites from air ventilation perspective when compared with the Baseline Scheme.

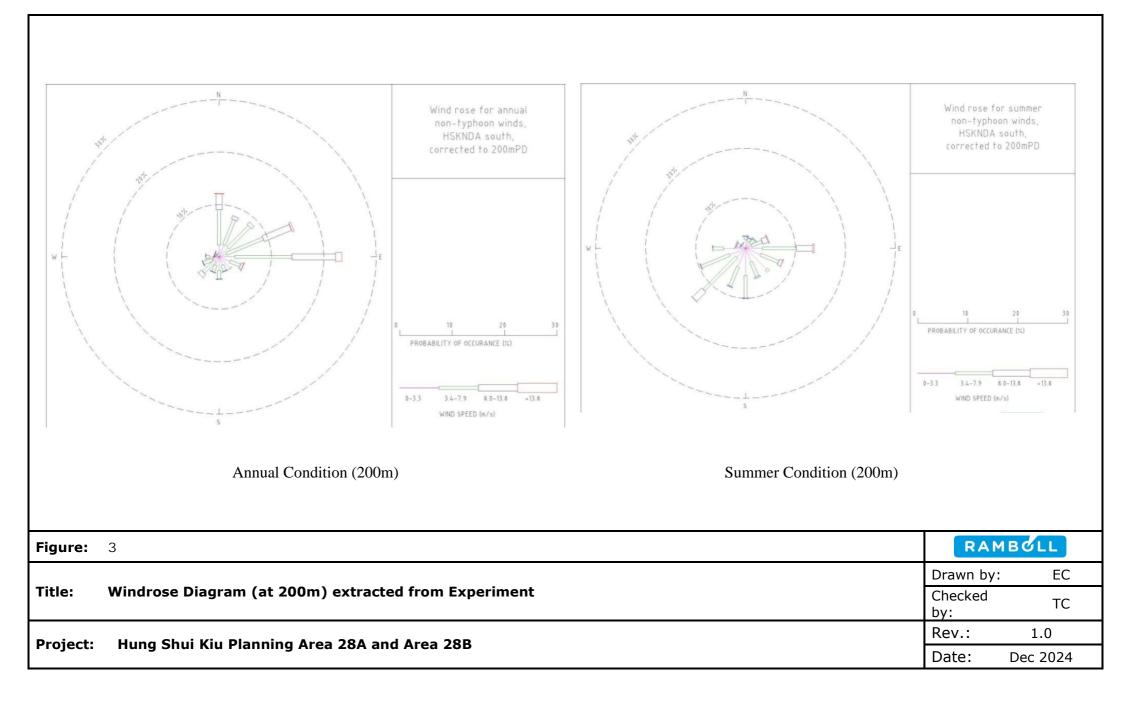


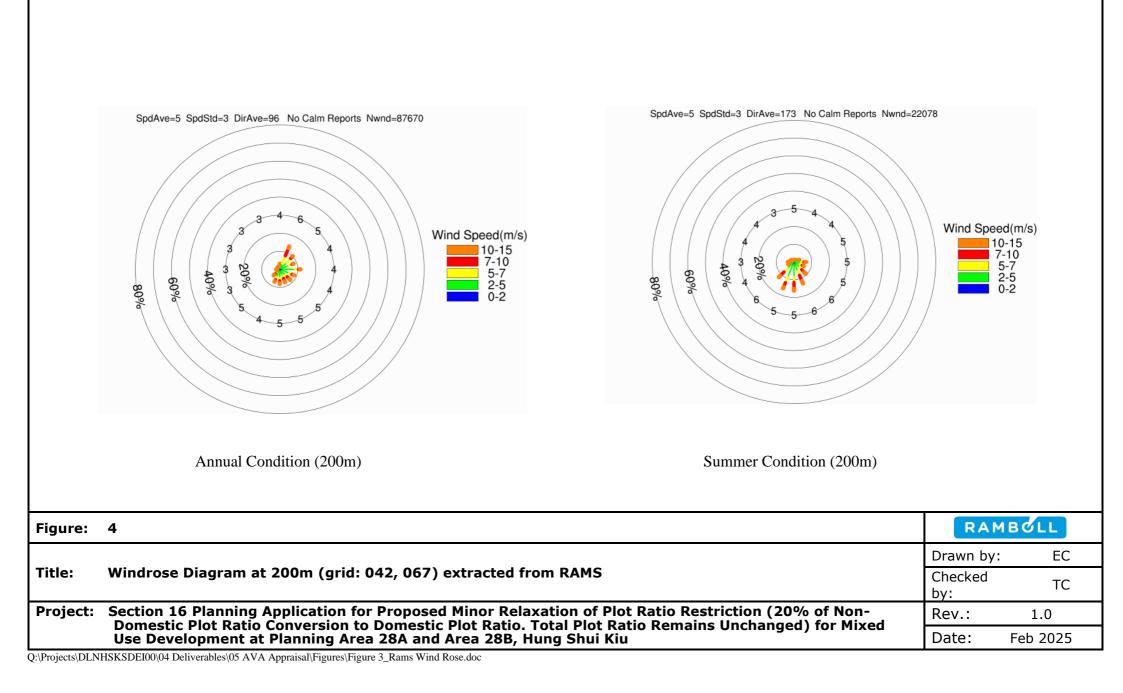
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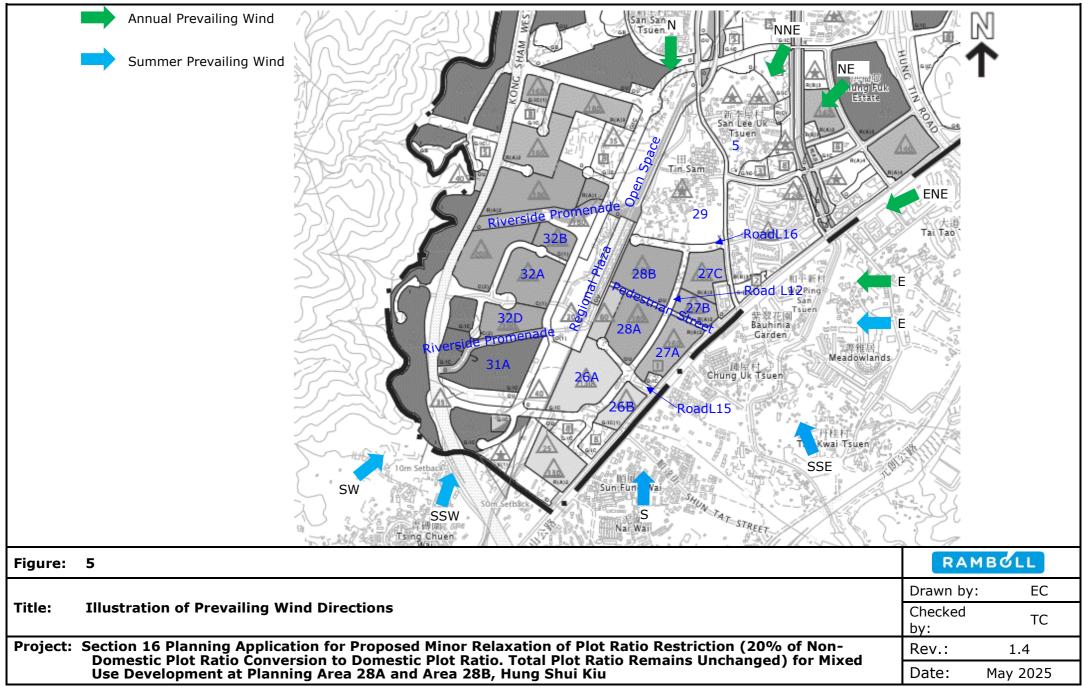




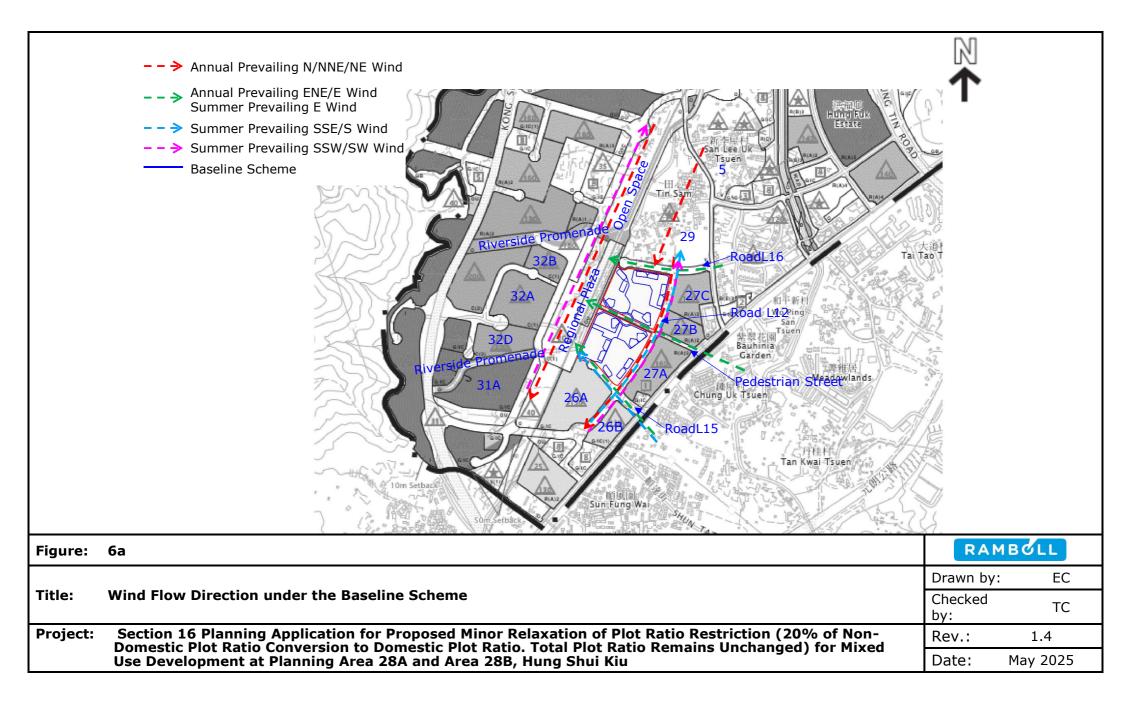


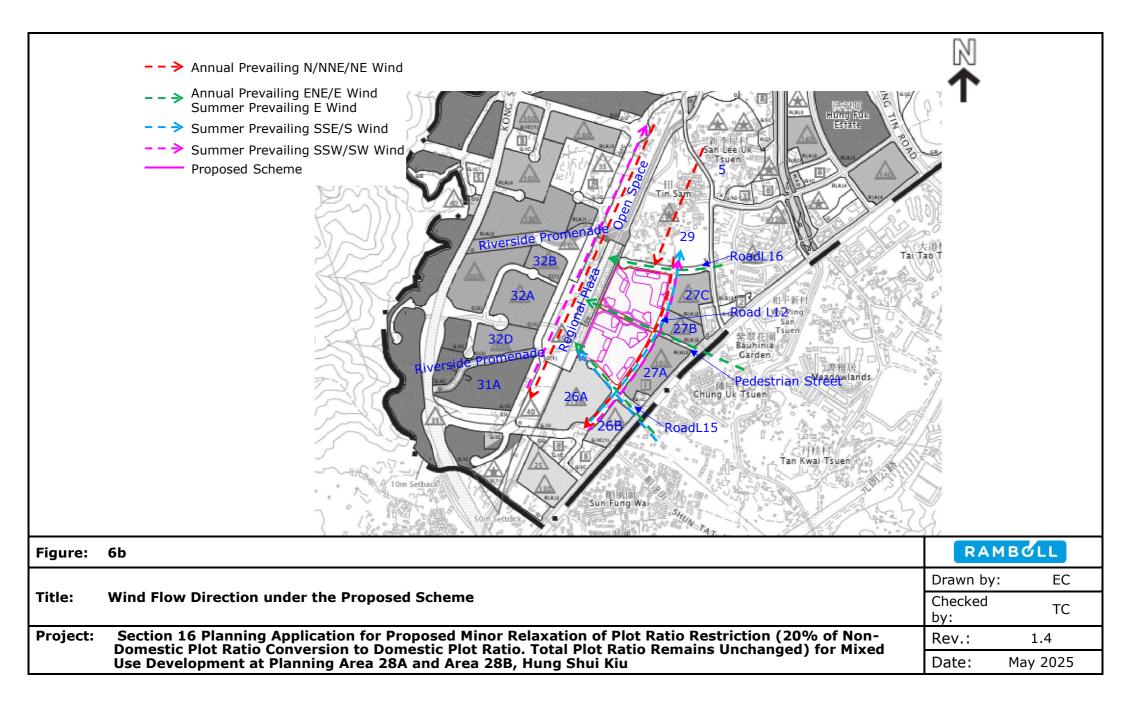






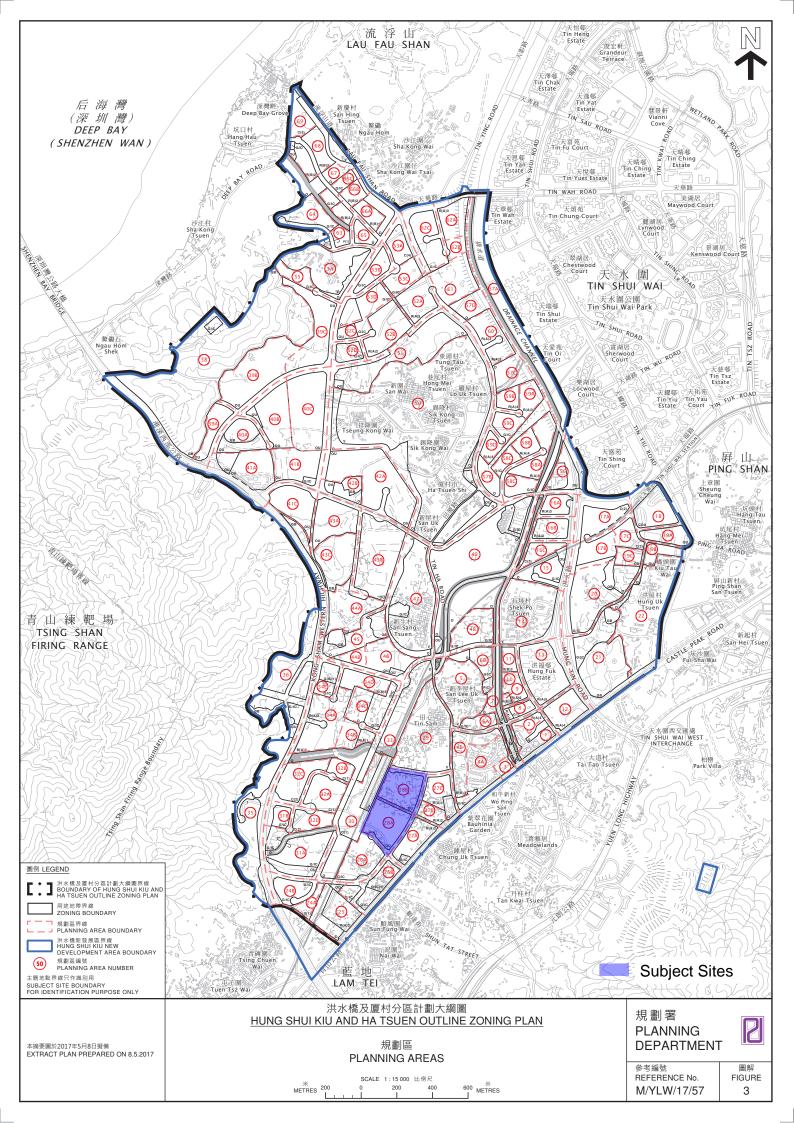
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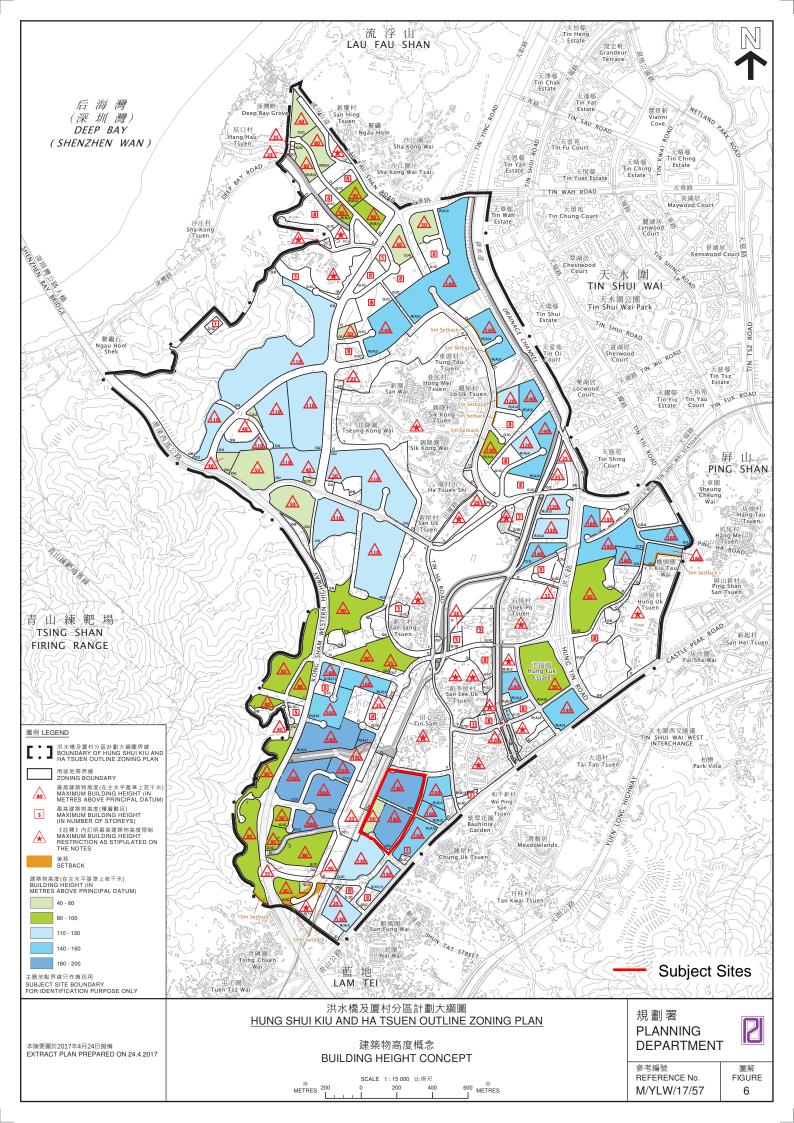


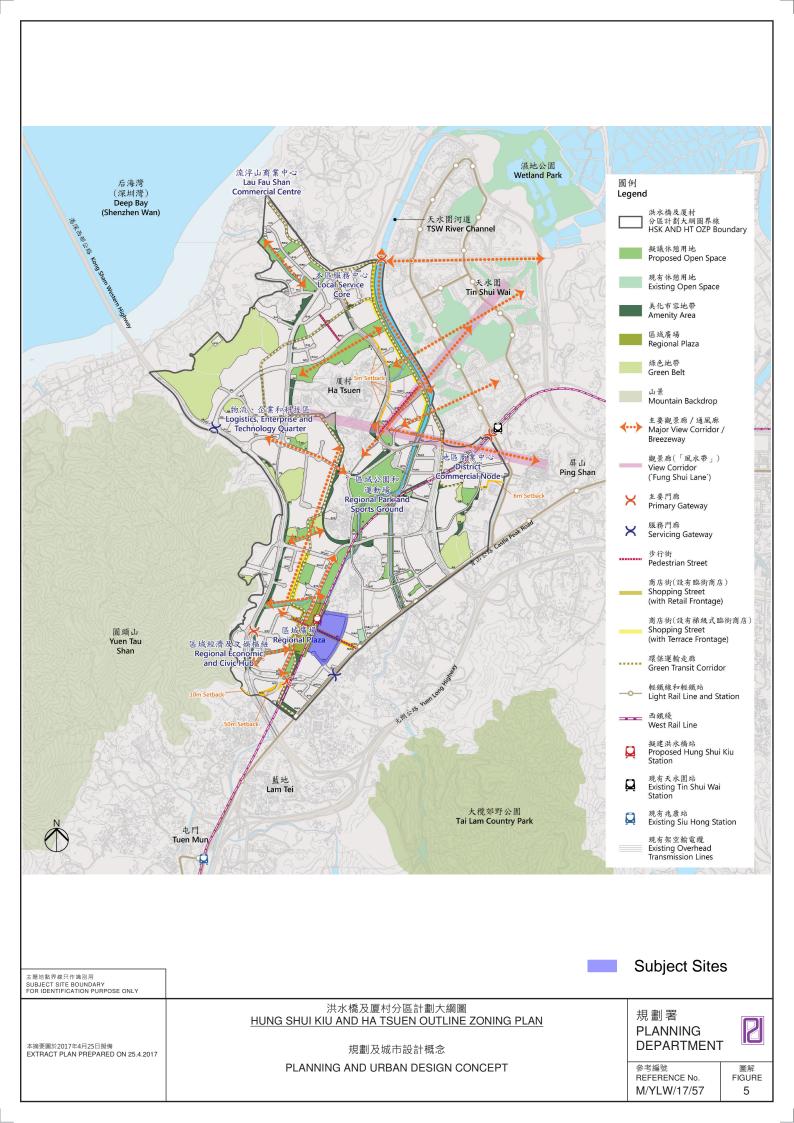


Appendix 1Extracts from the Approved Hung Shui Kiu and Ha TsuenOutline Zoning Plan No. S/HSK/2









Appendix 2Extract from the Hung Shui Kiu New Development AreaPlanning and Engineering Study - Investigation - Stage 3 AirVentilation Assessment (Final) (Agreement No. CE 2/2011(CE))



